

# 46

*Pierre Louis Moreau  
de Maupertuis*

1698-1759

ESSAIE DE COSMOLOGIE

1750

May we not say that, in the fortuitous combination of the productions of Nature, since only those creatures could survive in whose organization a certain degree of adaptation was present, there is nothing extraordinary in the fact that such adaptation is actually found in all those species which now exist? Chance, one might say, turned out a vast number of individuals; a small proportion of these were organized in such a manner that the animals' organs could satisfy their needs. A much greater number showed neither adaptation nor order, these last have all perished. . . . Thus the species which we see today are but a small part of all those that a blind destiny has produced.

strengthens, develops and enlarges that organ, and gives it a power proportional to the length of time it has been so used; while the permanent disuse of any organ imperceptibly weakens and deteriorates it, and progressively diminishes its functional capacity, until it finally disappears.

#### SECOND LAW

All the acquisitions or losses wrought by nature on individuals, through the influence of the environment in which their race has long been placed, and hence through the influence of the predominant use or permanent disuse of any organ; all these are preserved by reproduction to the new individuals which arise, provided that the acquired modifications are common to both sexes, or at least to the individuals which produce the young. . . .

It is interesting to observe the result of habit in the peculiar shape and size of the giraffe (*Camelo-pardalis*): this animal, the largest of the mammals, is known to live in the interior of Africa in places where the soil is nearly always arid and barren, so that it is obliged to browse on the leaves of trees and to make constant efforts to reach them. From this habit long maintained in all its race, it has resulted that the animal's fore-legs have become longer than its hind legs, and that its neck is lengthened to such a degree that the giraffe, without standing up on its hind legs, attains a height of six meters.

*Jean Baptiste Pierre  
Antoine de Monet,  
Chevalier de Lamarck*  
1744-1829

ZOOLOGICAL  
PHILOSOPHY

1809

Now the true principle to be noted in all this is as follows:

1. Every fairly considerable and permanent alteration in the environment of any race of animals works a real alteration in the needs of that race.
2. Every change in the needs of animals necessitates new activities on their part for the satisfaction of those needs, and hence new habits.
3. Every new need, necessitating new activities for its satisfaction, requires the animal either to make more frequent use of some of its parts which it previously used less, and thus greatly to develop and enlarge them; or else to make use of entirely new parts, to which the needs have imperfectly given birth by efforts of its inner feeling; this I shall shortly prove by means of known facts.

#### FIRST LAW

In every animal which has not passed the limit of its development, a more frequent and continuous use of any organ gradually

G. H. | *The Art of Publishing Obscurely*

It is clear that the idea of evolution was old before 1859. But what about the idea of natural selection? Was Darwin anticipated in this also? Should we credit Empedocles with this idea? At best, his statement seems to imply little more than a supposition of selection confined to the moment of creation, which is scarcely the all-pervasive and ever-acting force that we now conceive selection to be.

As a feast attracts jackals, so fame attracts fortune seekers. As soon as the *Origin of Species* was published various critics hastened to assert that the book was no more than Lamarck or Erasmus Darwin reborn; moreover, there was Buffon. All these men had some claim to the idea of evolution. As for natural selection, a claimant to this appeared in less than half a year after the *Origin* was published. In the *Gardeners' Chronicle* for 7 April 1860, one Patrick Matthew claimed the idea as his on the basis of some remarks he had published in 1831, quoting the passages in question. Replying two weeks later Darwin said: "I freely acknowledge that Mr. Matthew has anticipated by many years the explanation which I have offered of the origin of species, under the name of natural selection. I think that no one will be surprised that neither I, nor apparently any other naturalist, had heard of Mr. Matthew's views, considering how briefly they are

, and that they appeared in the appendix to a work on Timber and Arboriculture." Which is, one must admit, a ~~is~~ place to publish so monumental an idea.

later editions of the *Origin* Darwin included some words of : to Matthew; but Matthew regarded them as insufficient continued to push his claim. No one took him seriously; he was annoying. The irritation was brought to an end in 1865 , as Darwin wrote to his friend J. D. Hooker: "A Yankee has d my attention to a paper attached to Dr. Wells' famous 'Es- on Dew,' which was read in 1813 to the Royal Soc., but not i) printed, in which he applies most distinctly the principle atural Selection to the Races of Man. So poor old Patrick hew is not the first, and he cannot, or ought not, any longer ut on his title-pages, 'Discoverer of the principle of Natural etion'!"

ough "read" in 1813, this contribution of the physician Wil- Charles Wells (1757-1817) was not published until the year his death. The title of this book was even more curious i Mr. Matthew's, being. *Two Essays. Single Vision with Two s; Dew* Let's see what Dr. Wells had to say

Amongst men, as well as among other animals, varieties of a greater or less magnitude are constantly occurring. In a civilized country those varieties, for the most part, quickly disappear, from the intermarriages of different families . . . In districts, however, of very small extent, and having little intercourse with other countries, an accidental difference in the appearance of the inhabitants will often descend to their late posterity. . . . Again, those who attend to the improvement of domestic animals, when they find individuals possessing . . . the qualities they desire, couple a male and female of these together, then take the best of their offspring as a new stock, and in this way proceed till they approach as near the point in view as the nature of things will permit. But, what is here done by art, seems to be done with equal efficacy, though more slowly, by nature, in the formation of varieties of mankind, fitted for the country which they inhabit. Of the accidental varieties of man, which would occur among the first few and scattered inhabitants of Africa,

some would be better fitted than the others to bear the diseases of the country. This race would subsequently multiply, while the others would decrease, not only from their inability to sustain the attacks of disease, but from their incapacity of contending with their more vigorous neighbors.

A lawyer could make a good case out of this, and yet scientists blithely ignore Wells' claim to credit. Why? To an outsider such action may look like some sort of conspiracy designed to sequester all the credit within a clique. Scientists have a different explanation; they agree with the philosopher Alfred North Whitehead, who said: "We give credit not to the first man to have an idea but to the first one to take it seriously." If we accept this as a moral directive there is no question about assigning the credit for the idea of natural selection. In hundreds of pages and with scores upon scores of examples blanketing the entire field of biology, Darwin took the idea most seriously. Today, a century later, we take it even more seriously.

Why did Matthew and Wells fail to capitalize on their idea? Not knowing, it is safest for us to suppose no more than that they failed to recognize their diamond in the rough. This is a safe explanation, but—emboldened by Freud—can we not suggest another possibility? "Forgetting," we have learned, is seldom a mere negative act; we *will* to forget. Thus, failure may signify more than lack of ability; failure also may be the result of willing. All of us show great ingenuity in failing to see things which threaten our established system of values. The human implications of the idea of selection are so upsetting that even today most people, including many biologists, cannot see the most threatening of them. To see truly one needs to be free; but it is hard to be truly free.

Did Matthew and Wells dimly see some of these disturbing implications and "pull their punches"? We shall probably never know, so we certainly should not take very seriously this unprovable hypothesis. Yet I cannot forbear pointing to certain

gestive evidence—the very titles of the works in which they presented the *idea of natural selection*: *Single Vision with Two Eyes* and *Naval Timber and Arboriculture*. The most elaborate indexing apparatus available to scientists today would fail to index the idea of natural selection in either of these books if they were freshly published and sent to *Biological Abstracts*. Could it be that their authors did not want the idea to be noticed? It is no answer to point out that they must have wanted some notice to be taken, or else they would not have said anything at all. We all understand the ambivalence of human desires; it is possible to wish, and not wish, at the same time. In the theory of speech pathology such ambivalence is recognized as the primary cause of stuttering; the speaker wants to say something but fears disapproval by some significant Other, and so he "chooses" a way of saying, and not saying, at the same time. Some of the maneuvers of academic scholars stem from the same pathology: the relegation of important ideas to footnotes or tailnotes, for example, where there is a fair chance that the significant Other will not notice them, but where they are memorialized to be later pointed to if events prove the author was right (which makes him then willing to claim the credit). One of the most capable geneticists of the twentieth century has made life miserable for his colleagues by his all too frequent use of the Ploy of the Significant Footnote.

It is not provable, of course, but is it not at least possible that Wells and Matthew did not want to be heard when they announced the *idea of natural selection*? If so, the burial of the idea in treatises on binocular vision and naval timbers becomes understandable.

*Robert Chambers*

VESTIGES OF THE  
NATURAL HISTORY  
OF CREATION

1846

All that geology tells us of the succession of species appears natural and intelligible. Organic life *presses in*, as has been remarked, wherever there is room and encouragement for it, the forms being always such as suit the circumstances, and in a certain relation to them, as for example, where the limestone-forming seas produce an abundance of corals, crinoidea, and shell-fish....

The tendency of all these illustrations is to make us look to *development* as the principle which has been immediately concerned in the peopling of this globe, as process extending over a vast space of time, but which is nevertheless connected in character with the briefer process by which an individual being is evoked from a simple germ....

The idea, then, which I form of the progress of organic life upon our earth—and the hypothesis is applicable to all similar theatres of vital being—is, *that the simplest and most primitive type, under a law to which that of like-production is subordinate, gave birth to the type next above it, that this again produced the next higher, and so on to the very highest*, the stages of advance being in all cases very small—namely, from one species only to another; so that the phenomenon has always been of a simple and modest character. Thus, the production of new forms, as shown in the pages of the geological record, has never been anything more than a new stage of progress in gestation, an event

as simply natural, and attended as little by any circumstances of a wonderful or startling kind, as the silent advance of an ordinary mother from one week to another of her pregnancy. . . .

Now it is possible that wants and the exercise of faculties have entered in some manner into the production of the phenomena which we have been considering; but certainly not in the way suggested by Lamarck, whose whole notion is obviously inadequate to account for the rise of the organic kingdoms. Had the laws of organic development been known in his time, his theory might have been of a more imposing kind. It is upon these that the present hypothesis is mainly founded. I take existing natural means, and show them to have been capable of producing all the existing organisms, with the simple and easily conceivable aid of a higher generative law, which we perhaps still see operating upon a limited scale. I also go beyond the French philosopher to a very important point, the original Divine conception of all the forms of being which these natural laws were only instruments in working out and realizing. And what a preconception or forethought have we here! . . .

But the idea that any of the lower animals have been concerned in any way with the origin of man—is not this degrading? Degrading is a term expressive of a notion of the human mind, and the human mind is liable to prejudices which prevent its notions from being invariably correct. Were we acquainted for the first time with the circumstances attending the production of an individual of our race, we might equally think them degrading, and be eager to deny them, and exclude them from the admitted truths of nature. Knowing this fact familiarly, and beyond contradiction, a healthy and natural mind finds no difficulty in regarding it complacently. Creative Providence has been pleased to order that it should be so, and it must therefore be submitted to. The present hypothesis as to the progress of organic creation, if we become satisfied that it is in the main the reflection of a great truth, ought to be received precisely in this spirit. Say it

It appears to be historically true that the work of Wells and Matthew was without effect; none of their audience became concerned with the idea of natural selection. It was otherwise with the idea of evolution, especially the idea that man evolved from apes. As early as 1837, the Reverend Nicholas Wiseman—later made (in)famous as Browning's "Bishop Blougram"—opined that "It is revolting to think that our noble nature should be nothing more than the perfecting of the ape's maliciousness." Revolting or not, this was precisely what people were called upon to think when Robert Chambers, in 1844, published his shocking *Vestiges of Creation*.

Chambers was a highly successful Edinburgh publisher who also wrote popularizations of science. *Vestiges* was published anonymously, no doubt in part to avoid hurting his publishing business (though we must remember that anonymous publications were a much commoner thing a century ago than now). Chambers' book was enormously successful: by the time of the *Origin* it was in its tenth edition. As a scientific work it was poorly regarded by biologists, but Darwin, always kind, years later wrote: "In my opinion it has done excellent service in this country in calling attention to the subject, in removing prejudice, and in thus preparing the ground for the reception of analogous views."

The text given below is taken from the fourth edition, as published by Wiley and Putnam, New York, 1846. (G. H.)

have never waded beyond the surface of the things they pretend to know, must needs delight in the trashy skimmings of philosophy; and we venture to affirm that no man who has any name in science, properly so called, whether derived from profound study, or original labour in the field, has spoken well of the book, or regarded it with any feelings but those of deep aversion. We say this advisedly, after exchanging thoughts with some of the best informed men in Britain....

It is our maxim, that things must keep their proper places if they are to work together for any good. If our glorious maidens and matrons may not soil their fingers with the dirty knife of the anatomist, neither may they poison the springs of joyous thought and modest feeling, by listening to the seductions of this author; who comes before them with a bright, polished, and many-coloured surface, and the serpent coils of a false philosophy, and asks them again to stretch out their hands and pluck forbidden fruit—to talk familiarly with him of things which cannot be so much as named without raising a blush upon a modest cheek;—who tells them—that their Bible is a fable when it teaches them that they were made in the image of God—that they are the children of apes and the breeders of monsters—that he has *annulled all distinction between physical and moral*,—and that all the phenomena of the universe, dead and living, are to be put before the mind in a new jargon, and as the progression and development of a rank, unbending, and degrading materialism.

*William Whewell*  
1794-1866

INDICATIONS OF THE  
CREATOR  
1845

We see that animals and plants may, by the influence of breeding, and of external agents operating upon their constitution, be greatly modified, so as to give rise to varieties and races different from what before existed. How different, for instance, is one kind and breed of dog from another? Whether the wolf may, by domestication, become the dog? Whether the ourang-outang may, by the power of external circumstances, be brought within the circle of the human species? . . .

Indefinite divergence from the original type is not possible; and the extreme limit of possible variation may usually be reached in a short period of time; in short, *species have a real existence in nature*, and a transmutation from one to another does not exist. . . .

When species are modified by external causes, they usually degenerate, and do not advance. And there is no instance of species acquiring an entirely new sense, faculty, or organ, in addition to, or in place of the one it had before.

# 52

Alfred Tennyson

1809-1892

IN MEMORIAM

Selections from LV and LVI

1849

Are God and Nature then at strife,  
That Nature lends such evil dreams?  
So careful of the type she seems,  
So careless of the single life;

That I, considering everywhere  
Her secret meaning in her deeds,  
And finding that of fifty seeds  
She often brings but one to bear, . . .

"So careful of the type?" but no.  
From scarped cliff and quarried stone  
She cries, "A thousand types are gone:  
I care for nothing, all shall go.

"Thou makest thine appeal to me:  
I bring to life, I bring to death:  
The spirit does but mean the breath:  
I know no more." And he, shall he,

has pleased Providence to arrange that one species should give birth to another, until the second highest gave birth to man, who is the very highest: be it so; it is our part to admire and to submit. The very faintest notion of there being anything ridiculous or degrading in the theory—how absurd does it appear when we remember that every individual amongst us actually passes through the characters of the insect, the fish, and reptile (to speak nothing of others); before he is permitted to breathe the breath of life! But such notions are mere emanations of false pride and ignorant prejudice.

## 53

If further proof is needed that the idea of evolution was "in the air" before the *Origin* was published, consider this letter written by a 17-year-old university student. Young Jevons later became a distinguished economist. This passage is from his *Letters and Journal*, edited by his wife. (G. H.)

<i>William Stanley Jevons</i> 1835-1882	EVOLUTION 'IN THE AIR' 1852
--	--------------------------------

I have had several rather learned discussions with Harry about moral philosophy, from which it appears that I am decidedly "dependent moralist," not believing that we have any "moral sense" altogether separate and of a different kind from our animal feelings. I have also had a talk about the origin of species, or the manner in which the innumerable races of animals have been produced. I, as far as I can understand at present, firmly believe that all animals have been transformed out of one primitive form by the continued influence, for thousands and perhaps millions of years, of climate, geography, etc. . Lyell makes great fun of Lamarck's, that is, of this theory, but appears to me not to give any good reason against it.

the puzzles of Darwin's career is why he delayed in writing the *Origin of Species*. He wrote out a first of his theory in 1842, and a second of more than 100 pages in 1844. But it was 14 more years before he added the first word of this work. In the meantime Chambers published *Vestiges*, and there is little doubt that one of the deterrents to Darwin's publishing was the savage attack made on Chambers' work. Furthermore, it is without significance that among the influential supporters of *Vestiges* was Adam Sedgwick, one of Darwin's teachers and a man whose good opinion Darwin prized. (Sedgwick's review was published in the traditional anonymous style, but the authorship was no secret to the scientific world. If one considers the length of the review (85 pages) and the criticisms can hardly be regarded as ill-considered. H.)

*Adam Sedgwick*

1785-1873

NATURAL HISTORY  
OF CREATION

A review of *Vestiges*

*Edinburgh Review*, 82:1-85

1845

It may be asked, are we to account for the popularity of *Vestiges*, and the sudden sale of edition after edition? Men who live on nothing better than the trash of literature, and who

designed to bypass a difficult logical-theological point. If Adam was created from the dust, and Eve from Adam's rib, did the primeval pair possess navels? Some argued that since God creates nothing that is superfluous he would not have created navels in beings who were never nourished through umbilical cords. Opponents of this view held that the first humans were the type-specimens of all later humanity and must, therefore, have been blessed with typical navels. The umbilicus is normally evidence of a previous developmental history of the human body; but such cannot be true of the navels of Adam and Eve.

This was the metaphor that Gosse used for his book: that the fossils embedded in the rocks are like Adam's navel, structures formed there by God Himself, and having no developmental significance at all. Gosse was writing in a time when the conflict between science and theology was waxing ever fiercer; like many a man who stands in the middle, he was caught in a fire from both camps. The next selection, an excerpt from Gosse's book, is followed by the salvo of a man of religion, the Reverend Charles Kingsley (known to us for *Westward Ho!* and *Water Babies*). Gosse never recovered from the bitter reception given his book.

nomena, would be facts still. They would still be, as now, legitimate subjects of *examination and inquiry*. I do not know that a single conclusion, now accepted, would need to be given up, except that of actual chronology. And even in respect of this, it would be rather a modification than a relinquishment of what is at present held, we might still speak of the inconceivably long duration of the processes in question, provided we understand ideal instead of *actual* time;—that the duration was projected in the mind of God, and not really existent.

# 56

Charles Kingsley

1819-1875

OMPHALOS SCORNED

Letter to Philip Henry Gosse, 4  
May 1858

From *The Life of Philip Henry  
Gosse*

London Kegan Paul, Trench and  
Trubner, 1890

1858

Shall I tell you the truth? It is best. Your book is the first that ever made me doubt it [i.e., "the act of absolute creation"], and I fear it will make hundreds do so. Your book tends to prove this—that if we accept the fact of absolute creation, God becomes a *Deus quidem deceptor*. I do not mean merely in the case of fossils which pretend to be the bones of dead animals; but if

## 57

The autobiography of Charles Darwin is surely unique. He said that he wrote it for his children, that they might know what sort of man he was. At first sight, such a statement seems incredible. As an art form, autobiography is inherently—almost by definition—narcissistic; the larger world is so patently the audience the writer poses for. Yet when we read Darwin's autobiography—word by word, line by line, and between the lines—we end with the surprising conclusion that it really was written only for his family. Incredible, but true. The author is not posing for his picture; rather he is looking at himself with the same evaluative gaze he previously focused on pigeons, orchids, and earthworms. It is a scientific document. It is also warmly human.

It is painful to select only part of the *Autobiography* when it is so much of a piece. What is here reprinted is just the minimal amount needed to understand the origins of Darwin's greatest work. If you are dissatisfied with this small selection and are stimulated to seek out the whole, so much the better. (G. H.)

<i>Charles Darwin</i> 1809-1882	AUTOBIOGRAPHY 1876
------------------------------------	-----------------------

domestication and nature, some light might perhaps be thrown on the whole subject. My first note-book was opened in July 1837. I worked on true Baconian principles, and without any theory collected facts on a wholesale scale, more especially with respect to domesticated productions, by printed enquiries, by conversation with skilful breeders and gardeners, and by extensive reading. When I see the list of books of all kinds which I read and abstracted, including whole series of Journals and Transactions, I am surprised at my industry. I soon perceived that selection was the keystone of man's success in making useful races of animals and plants. But how selection could be applied to organisms living in a state of nature remained for some time a mystery to me.

In October 1838, that is, fifteen months after I had begun my systematic enquiry, I happened to read for amusement 'Malthus on Population,' and being well prepared to appreciate the struggle for existence which everywhere goes on from long-continued observation of the habits of animals and plants, it at once struck me that under these circumstances favourable variations would tend to be preserved, and unfavourable ones to be destroyed. The result of this would be the formation of new species. Here then I had at last got a theory by which to work; but I was so anxious to avoid prejudice, that I determined not for some time to write even the briefest sketch of it. In June 1842 I first allowed myself the satisfaction of writing a very brief abstract of my theory in pencil in 35 pages; and this was enlarged during the summer of 1844 into one of 230 pages, which I had fairly copied out and still possess.

But at that time I overlooked one problem of great importance; and it is astonishing to me, except on the principle of Columbus and his egg, how I could have overlooked it and its solution. This problem is the tendency in organic beings descended from the same stock to diverge in character as they become modified. That they have diverged greatly is obvious from the manner in which

Man, her last work, who seem'd so fair,  
Such splendid purpose in his eyes,  
Who roll'd the psalm to wintry skies,  
Who built him fanes of fruitless prayer,

Who trusted God was love indeed  
And love Creation's final law—  
Tho' Nature, red in tooth and claw  
With ravine, shrieked against his creed—

Who loved, who suffered countless ills,  
Who battled for the True, the Just,  
Be blown about the desert dust,  
Or seal'd within the iron hills?

species of all kinds can be classed under genera, genera under families, families under sub-orders and so forth; and I can remember the very spot in the road, whilst in my carriage, when to my joy the solution occurred to me, and this was long after I had come to Down. The solution, as I believe, is that the modified offspring of all dominant and increasing forms tend to become adapted to many and highly diversified places in the economy of nature.

Early in 1856 Lyell advised me to write out my views pretty fully, and I began at once to do so on a scale three or four times as extensive as that which was afterwards followed in my 'Origin of Species'; yet it was only an abstract of the materials which I had collected, and I got through about half the work on this scale. But my plans were overthrown, for early in the summer of 1858 Mr. Wallace, who was then in the Malay archipelago, sent me an essay "On the Tendency of Varieties to depart indefinitely from the Original Type;" and this essay contained exactly the same theory as mine. Mr. Wallace expressed the wish that if I thought well of his essay, I should send it to Lyell for perusal.

The circumstances under which I consented at the request of Lyell and Hooker to allow of an abstract from my MS., together with a letter to Asa Gray, dated September 5, 1857, to be published at the same time with Wallace's Essay, are given in the 'Journal of the Proceedings of the Linnean Society,' 1858, p. 45. I was at first very unwilling to consent, as I thought Mr. Wallace might consider my doing so unjustifiable, for I did not then know how generous and noble was his disposition. The extract from my MS. and the letter to Asa Gray had neither been intended for publication, and were badly written. Mr. Wallace's essay, on the other hand, was admirably expressed and quite clear. Nevertheless, our joint productions excited very little attention, and the

It has sometimes been said that the success of the 'Origin' proved "that the subject was in the air," or "that men's minds were prepared for it." I do not think that this is strictly true, for I occasionally sounded not a few naturalists, and never happened to come across a single one who seemed to doubt about the permanence of species. Even Lyell and Hooker, though they would listen with interest to me, never seemed to agree. I tried once or twice to explain to able men what I meant by Natural Selection, but signally failed. What I believe was strictly true is that innumerable well-observed facts were stored in the minds of naturalists ready to take their proper places as soon as any theory which would receive them was sufficiently explained. Another element in the success of the book was its moderate size; and this I owe to the appearance of Mr. Wallace's essay; had I published on the scale in which I began to write in 1856, the book would have been four or five times as large as the 'Origin,' and very few would have had the patience to read it.

I gained much by my delay in publishing from about 1839, when the theory was clearly conceived, to 1859; and I lost nothing by it, for I cared very little whether men attributed most originality to me or Wallace, and his essay no doubt aided in the reception of the theory. I was forestalled in only one important point, which my vanity has always made me regret, namely, the explanation by means of the Glacial period of the presence of the same species of plants and of some few animals on distant mountain summits and in the arctic regions. This view pleased me so much that I wrote it out in extenso, and I believe that it was read by Hooker some years before E. Forbes published his celebrated memoir on the subject. In the very few points in which we differed, I still think that I was in the right. I have never, of course, alluded in print to my having independently worked out this view.

Hardly any point gave me so much satisfaction when I was at work on the 'Origin,' as the explanation of the wide difference in

G. H. | *Did Adam Have a Navel?*

One of the saddest chapters in the history of evolutionary theory is the one contributed by Philip Henry Gosse, the father of the distinguished poet and critic, Sir Edmund Gosse. Philip Gosse, born in England, emigrated to the New World where he tried farming in Canada and teaching in Alabama before returning to England in 1839. He became a naturalist in the grand tradition; it was he, more than anyone else, who turned the attention of English naturalists toward the seashore and the microscope. Like many a fine descriptive biologist he was repelled by the thought of evolution. As a member of a conservative religious group, the Plymouth Brethren, he was moved to strike out vigorously against the growing heresy. He did so in a curious and now forgotten book entitled *Omphalos*.

The Greek word *omphalos* means navel. To understand the title's appropriateness to Gosse's theme you should leaf through a collection of reproductions of Renaissance paintings of Adam and Eve. If you do, you may note the curious position of the "accidentally" disposed greenery. That it generally covers the pubic region of each of the original sinners is no surprise, but you should also note that it often covers also the region of the navel. This is not because any great titillation was associated with the sight of the modest structure; rather, the obscuring herbiage was

many classes between the embryo and the adult animal, and of the close resemblance of the embryos within the same class. No notice of this point was taken, as far as I remember, in the early reviews of the 'Origin,' and I recollect expressing my surprise on this head in a letter to Asa Gray. Within late years several reviewers have given the whole credit to Fritz Müller and Haeckel, who undoubtedly have worked it out much more fully, and in some respects more correctly than I did. I had materials for a whole chapter on the subject, and I ought to have made the discussion longer; for it is clear that I failed to impress my readers; and he who succeeds in doing so deserves, in my opinion, all the credit.

This leads me to remark that I have almost always been treated honestly by my reviewers, passing over those without scientific knowledge as not worthy of notice. My views have often been grossly misrepresented, bitterly opposed and ridiculed, but this has been generally done, as I believe, in good faith. On the whole I do not doubt that my works have been over and over again greatly overpraised. I rejoice that I have avoided controversies, and this I owe to Lyell, who many years ago, in reference to my geological works, strongly advised me never to get entangled in a controversy, as it rarely did any good and caused a miserable loss of time and temper.

Whenever I have found out that I have blundered, or that my work has been imperfect, and when I have been contemptuously criticised, and even when I have been overpraised, so that I have felt mortified, it has been my greatest comfort to say hundreds of times to myself that "I have worked as hard and as well as I could, and no man can do more than this." I remember when in Good Success Bay, in Tierra del Fuego, thinking (and, I believe, that I wrote home to the effect) that I could not employ my life better than in adding a little to Natural Science. This I have done to the best of my abilities, and critics may say what they like, but they cannot destroy this conviction.

# 58

The 1858 presentation of Darwin's and Wallace's papers before the Linnaean Society included an abstract of a letter to the American botanist Asa Gray, which is reproduced below. Darwin's close friend, Joseph Hooker, reported that the interest at the meeting was intense. Nevertheless, the President of the Society, summing up at the end of the year, expressed his disappointment that 1858 had "not been marked by any of those striking discoveries which at once revolutionize, so to speak, the department of science on which they bear." In the popular and scholarly press of the day there is no critical reaction to contradict this judgment.

One recalls, and is haunted by, Brueghel's great painting, "The Fall of Icarus" (G. H.)

Charles Darwin

1809-1882

LETTER TO ASA GRAY

1858

I. It is wonderful what the principle of selection by man, that is the picking out of individuals with any desired quality, and breeding from them, and again picking out, can do. Even breeders have been astounded at their own results. They can act on differences inappreciable to an uneducated eye. Selection has been methodically followed in Europe for only the last half century, but it was occasionally, and even in some degree methodically, followed in the most ancient times. There must have been also a kind of unconscious selection from a remote period, namely

55

*Philip Henry Gosse*

1810-1888

OMPHALOS: AN ATTEMPT  
TO UNTIE THE GEOLOGI-  
CAL KNOT

*London: John Van Voorst*

1857

It has been shown that, without a solitary exception, the whole of the vast vegetable and animal kingdoms were created,—mark! I do not say *may* have been, but MUST have been created—on this principle of a prochronic development, with distinctly traceable records. It was *the law of organic creation*.

It may be objected, that, to assume the world to have been created with fossil skeletons in its crust,—skeletons of animals that never really existed—is to charge the Creator with forming objects whose sole purpose was to deceive us. The reply is obvious. Were the concentric timber-rings of a created tree formed merely to deceive? Were the growth lines of a created shell intended to deceive? Was the navel of the created Man intended to deceive him into the persuasion that he had had a parent? . . .

Finally, the acceptance of the principles presented in this volume, even in their fullest extent, would not, in the least degree, affect the study of scientific geology. The character and order of the strata; their descriptions and displacements and injections; the successive floras and faunas; and all the other phe-

in the preservation of the individual animals (without any thought of their offspring) most useful to each race of man in his particular circumstances. The "roguing," as nurserymen call the destroying of varieties which depart from their type, is a kind of selection. I am convinced that intentional and occasional selection has been the main agent in the production of our domestic races; but however this may be, its great power of modification has been indisputably shown in later times. Selection acts only by the accumulation of slight or greater variations, caused by external conditions, or by the mere fact that in generation the child is not absolutely similar to its parent. Man, by this power of accumulating variations, adapts living beings to his wants—may be said to make the wool of one sheep good for carpets, of another for cloth, &c.

2. Now suppose there were a being who did not judge by mere external appearances, but who could study the whole internal organization, who was never capricious, and should go on selecting for one object during millions of generations; who will say what he might not effect? In nature we have some *slight* variation occasionally in all parts; and I think it can be shown that changed conditions of existence is the main cause of the child not exactly resembling its parents; and in nature geology shows us what changes have taken place, and are taking place. We have almost unlimited time; no one but a practical geologist can fully appreciate this. Think of the Glacial period, during the whole of which the same species at least of shells have existed; there must have been during this period millions on millions of generations.

3. I think it can be shown that there is such an unerring power at work in *Natural Selection* (the title of my book), which selects exclusively for the good of each organic being. The elder De Candolle, W. Herbert, and Lyell have written excellently on the struggle for life; but even they have not written strongly enough. Reflect that every being (even the elephant) breeds at such a rate,

that in a few years, or at most a few centuries, the surface of the earth would not hold the progeny of one pair. I have found it hard constantly to bear in mind that the increase of every single species is checked during some part of its life, or during some shortly recurrent generation. Only a few of those annually born can live to propagate their kind. What a trifling difference must often determine which shall survive, and which perish!

4. Now take the case of a country undergoing some change. This will tend to cause some of its inhabitants to vary slightly—not but that I believe most beings vary at all times enough for selection to act on them. Some of its inhabitants will be exterminated; and the remainder will be exposed to the mutual action of a different set of inhabitants, which I believe to be far more important to the life of each being than mere climate. Considering the infinitely various methods which living beings follow to obtain food by struggling with other organisms, to escape danger at various times of life, to have their eggs or seeds disseminated, &c. &c., I cannot doubt that during millions of generations individuals of a species will be occasionally born with some slight variation, profitable to some part of their economy. Such individuals will have a better chance of surviving, and of propagating their new and slightly different structure; and the modification may be slowly increased by the accumulative action of natural selection to any profitable extent. The variety thus formed will either coexist with, or, more commonly, will exterminate its parent form. An organic being, like the woodpecker or mistletoe, may thus come to be adapted to a score of contingencies—natural selection accumulating those slight variations in all parts of its structure, which are in any way useful to it during any part of its life.

5. Multiform difficulties will occur to every one, with respect to this theory. Many can, I think, be satisfactorily answered. *Natura non facit saltum* answers some of the most obvious. The

the one single case of your newly created scars on the panda trunk, and your newly created Adam's navel, you make God a lie. It is not my reason, but my *conscience* which revolts he which makes me say, 'Come what will, disbelieve what I m I cannot believe this of a God of truth, of Him who is Light a no darkness at all, of Him who formed the intellectual man af His own Image, that he might understand and glory in I Father's works.' I ought to feel this I say, of the single Adar navel, but I can hush up my conscience at the single instance at the great sum total, the worthlessness of all geologic instru tion, I cannot. I cannot give up the painful and slow conclusi of five and twenty years' study of geology, and believe that G has written on the rocks one enormous and superfluous lie f all mankind. . . .

To this painful dilemma you have brought me, and will, fear, bring hundreds. It will not make me throw away my Bibl I trust and hope. I know in whom I have believed, and can tru Him to bring my faith safe through this puzzle, as He has throug others; but for the young I do fear. I would not for a thousan pounds put your book into my children's hands. . . .

I do fear, with the editor of this month's *Geologist*, that yc have given the 'vestiges of creation theory' the best shove forwar which it has ever had. I have a special dislike to that book; bu honestly, I felt my heart melting toward it as I read *Omphalos*.

slowness of the change, and only a very few individuals undergoing change at any one time, answers others. The extreme imperfection of our geological records answers others.

6. Another principle, which may be called the principle of divergence, plays, I believe, an important part in the origin of species. The same spot will support more life if occupied by very diverse forms. We see this in the many generic forms in a square yard of turf, and in the plants or insects on any little uniform islet, belonging almost invariably to as many genera and families as species. We can understand the meaning of this fact amongst the higher animals, whose habits we understand. We know that it has been experimentally shown that a plot of land will yield a greater weight if sown with several species and genera of grasses, than if sown with only two or three species. Now, every organic being, by propagating so rapidly, may be said to be striving its utmost to increase in numbers. So it will be with the offspring of any species after it has become diversified into varieties, or sub-species, or true species. And it follows, I think, from the foregoing facts, that the varying offspring of each species will try (only few will succeed) to seize on as many and as diverse places in the economy of nature as possible. Each new variety or species, when formed, will generally take the place of, and thus exterminate its less well-fitted parent. This I believe to be the origin of the classification and affinities of organic beings at all times; for organic beings always *seem* to branch and sub-branch like the limbs of a tree from a common trunk, the flourishing and diverging twigs destroying the less vigorous—the dead and lost branches rudely representing extinct genera and families.

This sketch is *most* imperfect; but in so short a space I cannot make it better. Your imagination must fill up very wide blanks.

## 59

That Wallace had a fair idea of the contents of Darwin's impending great work before 1858 is clear from the published correspondence of the two men. For example, there is that famous letter of 22 December 1857, the letter in which Darwin said, "I am a firm believer that without speculation there is no good and original observation," thus repudiating the rigid Baconian view of science so worshipped by Whewell and other philosophers of the day. Toward the end of this letter, Darwin said to Wallace: "You ask whether I shall discuss 'man.' I think I shall avoid the whole subject, as so surrounded with prejudices; though I fully admit that it is the highest and most interesting problem for the naturalist."

Darwin stuck to this intention. The following passage, which concludes the *Origin of Species*, includes the only reference to man in the entire work. The wording is that of the sixth edition, which differs slightly from the first. (G. II.)

Charles Darwin	THE ORIGIN OF SPECIES
1809-1882	1859

In the future I see open fields for far more important researches. Psychology will be securely based on the foundation already well laid by Mr. Herbert Spencer, that of the necessary acquirement of each mental power and capacity by gradation. Much light will be thrown on the origin of man and his history.

Authors of the highest eminence seem to be fully satisfied with the view that each species has been independently created. To my mind it accords better with what we know of the laws impressed on matter by the Creator, that the production and extinction of the past and present inhabitants of the world should have been due to secondary causes, like those determining the birth and death of the individual. When I view all beings not as special creations, but as the lineal descendants of some few beings which lived long before the first bed of the Cambrian system was deposited, they seem to me to become ennobled. Judging from the past, we may safely infer that not one living species will transmit its unaltered likeness to a distant futurity. And of the species now living very few will transmit progeny of any kind to a far distant futurity; for the manner in which all organic beings are grouped, shows that the greater number of species in each genus, and all the species in many genera, have left no descendants, but have become utterly extinct. We can so far take a prophetic glance into futurity as to foretell that it will be the common and widely-spread species, belonging to the larger and dominant groups within each class, which will ultimately prevail and procreate new and dominant species. As all the living forms of life are the lineal descendants of those which lived long before the Cambrian epoch, we may feel certain that the ordinary succession by generation has never once been broken, and that no cataclysm has desolated the whole world. Hence we may look with some confidence to a secure future of great length. And as natural selection works solely by and for the good of each being, all corporeal and mental endowments will tend to progress towards perfection.

It is interesting to contemplate a tangled bank, clothed with many plants of many kinds, with birds singing on the bushes, with various insects flitting about, and with worms crawling through the damp earth, and to reflect that these elaborately constructed forms, so different from each other, and dependent

upon each other in so complex a manner, have all been produced by laws acting around us. These laws, taken in the largest sense, being Growth with Reproduction; Inheritance which is almost implied by reproduction; Variability from the indirect and direct action of the conditions of life, and from use and disuse; a Ratio of Increase so high as to lead to a Struggle for Life, and as a consequence to Natural Selection, entailing Divergence of Character and the Extinction of less-improved forms. Thus, from the war of nature, from famine and death, the most exalted object which we are capable of conceiving, namely, the production of the higher animals, directly follows. There is grandeur in this view of life, with its several powers, having been originally breathed by the Creator into a few forms or into one; and that, whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been, and are being evolved.

what was new in them was false, and what was true was old. This shows how necessary it is that any new view should be explained at considerable length in order to arouse public attention.

In September 1858 I set to work by the strong advice of Lye and Hooker to prepare a volume on the transmutation of species; but was often interrupted by ill-health, and short visits to Dr. Lane's delightful hydropathic establishment at Moor Park. I abstracted the MS. begun on a much larger scale in 1856, and completed the volume on the same reduced scale. It cost me thirteen months and ten days' hard labour. It was published under the title of the 'Origin of Species,' in November 1859. Though considerably added to and corrected in the later editions, it has remained substantially the same book.

It is no doubt the chief work of my life. It was from the first highly successful. The first small edition of 1250 copies was sold on the day of publication, and a second edition of 3000 copies soon afterwards. Sixteen thousand copies have now (1876) been sold in England; and considering how stiff a book it is, this is a large sale. It has been translated into almost every European tongue, even into such languages as Spanish, Bohemian, Polish, and Russian. . . .

The success of the 'Origin' may, I think, be attributed in large part to my having long before written two condensed sketches, and to my having finally abstracted a much larger manuscript, which was itself an abstract. By this means I was enabled to select the more striking facts and conclusions. I had, also during many years followed a golden rule, namely, that whenever a published fact, a new observation or thought came across me, which was opposed to my general results, to make a memorandum of it without fail and at once; for I had found by experience that such facts and thoughts were far more apt to escape from the memory than favourable ones. Owing to this habit, very few objections were raised against my views which I had not at least noticed and attempted to answer.

As an indication and general summary of the line of argument I have adopted, I here give a brief demonstration in a tabular form of the Origin of Species by means of Natural Selection, referring for the *facts* to Mr. Darwin's works, and to the pages in this volume, where they are more or less fully treated.

### A Demonstration of the Origin of Species by Natural Selection

#### PROVED FACTS

RAPID INCREASE OF ORGANISMS, pp. 23, 142 (*Origin of Species*, p. 75, 5th ed.)

TOTAL NUMBER OF INDIVIDUALS STATIONARY, p. 23

#### NECESSARY CONSEQUENCES (afterwards taken as Proved Facts)

STRUGGLE FOR EXISTENCE, the deaths equaling the births on the average, p. 24 (*Origin of Species*, chap. III.)

#### STRUGGLE FOR EXISTENCE.

HEREDITY WITH VARIATION, or general likeness with individual differences of parents and offsprings, pp. 142, 156, 179 (*Origin of Species*, chaps. I. II. V.)

SURVIVAL OF THE FITTEST, or Natural Selection; meaning, simply, that on the whole those die who are least fitted to maintain their existence (*Origin of Species*, chap. IV.)

SURVIVAL OF THE FITTEST  
CHANGE OF EXTERNAL CONDITIONS, universal and unceasing—See Lyell's *Principles of Geology*.

CHANGES OF ORGANIC FORMS, to keep them in harmony with the Changed Conditions; and as the changes of conditions are permanent changes, in the sense of not reverting back to identical previous conditions, the changes of organic forms must be in the same sense permanent, and thus originate SPECIES.

61

*Adam Sedgwick*  
1785-1873

OBJECTIONS TO MR. DAR-  
WIN'S THEORY OF THE  
ORIGIN OF SPECIES

(Published anonymously)

*The Spectator*, 33 (24 March  
1860):284-286

1860

I must in the first place observe that Darwin's theory is not *inductive*,—not based on a series of acknowledged facts pointing to a general conclusion,—not a proposition evolved out of the facts, logically, and of course including them. To use an old figure, I look on the theory as a vast pyramid resting on its apex, and that apex a mathematical point. . . .

Species have been constant for thousands of years; and time (so far as I see my way) though multiplied by millions and billions would never change them, so long as the conditions remained constant. Change the conditions, and the old species would disappear; and new species *might* have room to come in and flourish. But how, and by what causation? I say by *creation*. But, what do I mean by *creation*? I reply, the operation of a power quite beyond the powers of a pigeon-fancier, a cross-breeder, or hybridizer; a power I cannot imitate or comprehend; but in which I can believe, by a legitimate conclusion of sound

reason drawn from the laws and harmonies of Nature,—proving in all around me a design and purpose, and a mutual adaptation of parts, which I *can comprehend*,—and which prove that there is exterior to, and above, the mere phenomena of Nature a great prescient and designing cause. Believing this, I have no difficulty in the repetition of new species.

But Darwin would say I am introducing a *miracle* by the supposition. In one sense I am; in another I am not. The hypothesis does not suspend or interrupt an established law of Nature. It does suppose the introduction of a new phenomenon unaccounted for by the operation of any *known* law of Nature; and it appeals to a power above established laws, and yet acting in conformity with them.

The pretended physical philosophy of modern days strips Man of all his moral attributes, or holds them of no account in the estimate of his origin and place in the created world. A cold atheistical materialism is the tendency of the so-called material philosophy of the present day. Not that I believe that Darwin is an atheist, though I cannot but regard his materialism as atheistical. I think it untrue, because opposed to the obvious course of Nature, and the very opposite of inductive truth. And I think it intensely mischievous. . . .

I need hardly go on any further with these objections. But I cannot conclude without expressing my detestation of the theory, because of its unflinching materialism,—because it has deserted the inductive track, the only track that leads to physical truth;—because it utterly repudiates final causes, and thereby indicates a demoralized understanding on the part of its advocates.

Such an account does, however, exist in a letter written to Dr. Dyster within a few months of the meeting, on September 9, 1860, and now preserved in the collection of Huxley Papers at the Imperial College of Science and Technology, London. The style of the quotation has the authentic tone: the putting his opponent in the wrong from the start, the use of antithesis, the long complex build-up to a dramatic pause, and then the final swift and decisive swoop. Considering also the accuracy with which Huxley was able to recall the details of what he had once formulated in his mind, it seems likely that this letter contains as nearly correct a record as we shall ever possess.

"When I got up I spoke pretty much to the effect—that I had listened with great attention to the Lord Bishop's speech but had been unable to discover either a new fact or a new argument in it—except indeed the question raised as to my personal predilections in the matter of ancestry—That it would not have occurred to me to bring forward such a topic as that for discussion myself, but that I was quite ready to meet the Right Rev. prelate even on that ground. If then, said I, the question is put to me would I rather have a miserable ape for a grandfather or a man highly endowed by nature and possessing great means and influence and yet who employs those faculties and that influence for the mere purpose of introducing ridicule into a grave scientific discussion—I unhesitatingly affirm my preference for the ape.

"Whereupon there was unextinguishable laughter among the people, and they listened to the rest of my argument with the greatest attention . . . I happened to be in very good condition and said my say with perfect good temper and politeness—I assure you of this because all sorts of reports [have] been spread about e.g. that I had said I would rather be an ape than a bishop, etc."

I am indebted to the Governors of the Imperial College for permission to publish this extract.

<sup>1</sup> Imperial College, "The Huxley Papers," 15, 117-118

Such an account does, however, exist in a letter written to Dr. Dyster within a few months of the meeting, on September 9, 1860, and now preserved in the collection of Huxley Papers at the Imperial College of Science and Technology, London. The style of the quotation has the authentic tone: the putting his opponent in the wrong from the start, the use of antithesis, the long complex build-up to a dramatic pause, and then the final swift and decisive swoop. Considering also the accuracy with which Huxley was able to recall the details of what he had once formulated in his mind, it seems likely that this letter contains as nearly correct a record as we shall ever possess.

"When I got up I spoke pretty much to the effect—that I had listened with great attention to the Lord Bishop's speech but had been unable to discover either a new fact or a new argument in it—except indeed the question raised as to my personal predilections in the matter of ancestry—That it would not have occurred to me to bring forward such a topic as that for discussion myself, but that I was quite ready to meet the Right Rev. prelate even on that ground. If then, said I, the question is put to me would I rather have a miserable ape for a grandfather or a man highly endowed by nature and possessing great means and influence and yet who employs those faculties and that influence for the mere purpose of introducing ridicule into a grave scientific discussion—I unhesitatingly affirm my preference for the ape.

"Whereupon there was unextinguishable laughter among the people, and they listened to the rest of my argument with the greatest attention . . . I happened to be in very good condition and said my say with perfect good temper and politeness—I assure you of this because all sorts of reports [have] been spread about e.g. that I had said I would rather be an ape than a bishop, etc."<sup>2</sup>

I am indebted to the Governors of the Imperial College for permission to publish this extract.

<sup>2</sup> Imperial College, "The Huxley Papers," 15, 117-118.

Such an account does, however, exist in a letter written to Dr. Dyster within a few months of the meeting, on September 9, 1860, and now preserved in the collection of Huxley Papers at the Imperial College of Science and Technology, London. The style of the quotation has the authentic tone: the putting his opponent in the wrong from the start, the use of antithesis, the long complex build-up to a dramatic pause, and then the final swift and decisive swoop. Considering also the accuracy with which Huxley was able to recall the details of what he had once formulated in his mind, it seems likely that this letter contains as nearly correct a record as we shall ever possess.

"When I got up I spoke pretty much to the effect—that I had listened with great attention to the Lord Bishop's speech but had been unable to discover either a new fact or a new argument in it—except indeed the question raised as to my personal predilections in the matter of ancestry—That it would not have occurred to me to bring forward such a topic as that for discussion myself, but that I was quite ready to meet the Right Rev. prelate even on that ground. If then, said I, the question is put to me would I rather have a miserable ape for a grandfather or a man highly endowed by nature and possessing great means and influence and yet who employs those faculties and that influence for the mere purpose of introducing ridicule into a grave scientific discussion—I unhesitatingly affirm my preference for the ape.

"Whereupon there was unextinguishable laughter among the people, and they listened to the rest of my argument with the greatest attention . . . I happened to be in very good condition and said my say with perfect good temper and politeness—I assure you of this because all sorts of reports [have] been spread about e.g. that I had said I would rather be an ape than a bishop, etc."<sup>2</sup>

I am indebted to the Governors of the Imperial College for permission to publish this extract.

<sup>2</sup> Imperial College, "The Huxley Papers," 15, 117-118.

on the advantages of H. Spencer's excellent expression of 'the survival of the fittest.'<sup>1</sup> This, however, had not occurred to me till reading your letter. It is, however, a great objection to this term that it cannot be used as a substantive governing a verb; and that this is a real objection I infer from H. Spencer continually using the words, natural selection. I formerly thought, probably in an exaggerated degree, that it was a great advantage to bring into connection natural and artificial selection; this indeed led me to use a term in common, and I still think it some advantage. I wish I had received your letter two months ago, for I would have worked in 'the survival, &c.,' often in the new edition of the 'Origin,' which is now almost printed off, and of which I will of course send you a copy. I will use the term in my next book on Domestic animals, &c., from which, by the way, I plainly see that you expect much, too much. The term Natural Selection has now been so largely used abroad and at home, that I doubt whether it could be given up, and with all its faults I should be sorry to see the attempt made. Whether it will be rejected must now depend 'on the survival of the fittest.' As in time the term must grow intelligible the objections to its use will grow weaker and weaker. I doubt whether the use of any term would have made the subject intelligible to some minds, clear as it is to others; for do we not see even to the present day Malthus on Population absurdly misunderstood? This reflection about Malthus has often comforted me when I have been vexed at the misstatement of my views.

<sup>1</sup> Extract from a letter of Mr. Wallace's, July 2, 1866: "The term "survival of the fittest" is the plain expression of the fact; "natural selection" is a metaphorical expression of it, and to a certain degree indirect and incorrect, since . . . Nature . . . does not so much select special varieties as exterminate the most unfavourable ones."

# 72

Alfred W. Bennett

1833-1902

IS HOBBES ENOUGH?

The Theory of Natural Selection  
From a Mathematical Point of  
View

*Nature*, 3 30-33

1870

It [Darwin's theory] has been opposed, of course, by theologians; but, were it not that the theological mind is inherently averse to the reception of new ideas, it would have been seen that the supposition that the Creative Power works by continuous modification and adaptation of contrivance to end, by a constant exercise of His prerogative, is a far higher tribute to His exalted attributes, than the popular dogma that all living things were created as we now see them by one single gigantic effort, after which the power collapsed, and has never since been exercised. . . .

The argument of 'design' was undoubtedly pushed by pre-Darwinian writers to too great a extent. The most recent phase of Darwinianism, however, is a complete denial of the existence of design in Nature. It is the carrying into Natural Science of the Hobbesian principle of Self-love. Every individual and every species exists for its own advantage only, and has no *raison d'être* except its own welfare. To my mind the beauties and wonders of Nature seem, on the other hand, to teach a different lesson, that,

similarity with human purposefulness; nay, that her most essential means is such that, measured by the standard of human understanding, it can only be compared with the blindest chance. On this point we need wait for no future proof; the facts speak so plainly and in the most various provinces of nature so unanimously, that no view of things is henceforth admissible which contradicts these facts and their necessary meaning.

If a man, in order to shoot a hare, were to discharge thousands of guns on a great moor in all possible directions; if, in order to get into a locked-up room, he were to buy ten thousand casual keys, and try them all; if, in order to have a house, he were to build a town, and leave all the other houses to wind and weather, —assuredly no one would call such proceedings purposeful, and still less would any one conjecture behind these proceedings a higher wisdom, unrevealed reasons, and superior prudence. But whoever will study the modern scientific laws of the conservation and propagation of species, even of those species the purpose of which we cannot see, as, e.g., the intestinal worms, will everywhere find an enormous waste of vital germs. From the pollen of the plant to the fertilised seed, from the seed to the germinating plant, from this to the full-grown plant bearing seed in its turn, we constantly see repeated the mechanism which, through thousandfold production for immediate destruction, and through the casual coincidence of favourable conditions, maintains life, so far as we see it maintained in the existing state of things. The perishing of vital germs, the abortion of the process begun, is the rule, the "natural" development is a special case among thousands; it is the exception, and this exception is the result of that Nature whose purposeful self-conservation the teleologist shortsightedly admires. "We behold the face of nature," says Darwin, "bright with gladness, we often see superabundance of food; we do not see, or we forget, that the birds which are idly singing round us mostly live on insects or seeds, and are thus constantly destroying life; or we forget how largely these songsters, or their eggs, or their nestlings, are destroyed by birds and beasts of prey;

we do not always bear in mind that although food may be now superabundant, it is not so at all seasons of each recurring year." The struggle for a spot of earth, success or nonsuccess in the persecution and extermination of other life, determines the propagation of plants and animals. Millions of spermatozoa, eggs, young creatures, hover between life and death that single individuals may develop themselves. Human reason knows no other ideal than the presence and perfection, as far as may be, of the life that has begun, combined with the limitation of births and deaths. To Nature luxuriant propagation and painful destruction are only two oppositely working forces which seek an equilibrium. Even for the "civilised" world political economy has revealed the sad law that misery and famine are the great regulators of the increase of population. Nay, even in the intellectual sphere it seems to be the method of Nature that she flings a thousand equally gifted and aspiring spirits into wretchedness and despair in order to form a single genius, which owes its development to the favour of circumstances. Sympathy, the fairest flower of earthly organisms, breaks forth only at isolated points, and is even in the life of humanity more an ideal than one of its ordinary motives.

What we call Chance in the development of species is, of course, no chance in the sense of the universal laws of Nature, whose mighty activity calls forth all these effects; but it is, in the strictest sense of the word, chance, if we regard this expression in opposition to the results of a humanly calculating intelligence. Where, however, we find adaptation in the organs of animals or plants, there we may assume that in the eternal slaughter of the weak countless less adapted forms were destroyed, so that here too that which maintains itself is only the favourable special case in the ocean of birth and death. This, then, would be, in fact, a fragment of the much-reviled philosophy of Empedokles, confirmed by the endless materials which only the last decades of exact research have brought to light.

## 60

One possible controversy that, blessedly, did not develop in history, was a controversy over credit for the Darwinian theory. Wallace's admirers repeatedly tried to put forward his claim, but he steadfastly refused to be tempted to contest. He even entitled one of his books *Darwinism*. And on 1 July 1908, at a semicentennial celebration before the Linnaean Society, Wallace stated: "It was really a singular piece of good luck that gave me any share whatever in the discovery . . . it was only Darwin's extreme desire to perfect his work that allowed me to come in, as a very bad second, in the truly Olympian race in which all philosophical biologists, from Buffon and Erasmus Darwin to Richard Owen and Robert Chambers, were more or less actively engaged."

What is Darwinism? Darwin himself had trouble (like most deeply involved authors) in stating his theory briefly. Perhaps the best resume was given by Wallace, in the conclusion of his *Natural Selection and Tropical Nature*. This analysis has been often reprinted in textbooks—without credit, of course. (G. H.)

Alfred Russel Wallace | CREATION BY LAW

1823-1913

1868

I have thus endeavoured to meet fairly, and to answer plainly, a few of the most common objections to the theory of natural selection, and I have done so in every case by referring to admitted facts and to logical deductions from these facts.

74

*Vernon L. Kellogg*

1857-1937

DARWINISM TO-DAY

New York: Holt

1907

Says one of the [anti-Darwinists].<sup>1</sup> "Darwinism now belongs to history, like that other curiosity of our century, the Hegelian philosophy; both are variations on the theme, how one manages to lead a whole generation by the nose." The same writer also speaks of "the softening of the brain of the Darwinians." Another one,<sup>2</sup> in similarly relegating Darwinism to the past, takes much pleasure in explaining that "we (anti-Darwinians) are now standing by the death-bed of Darwinism, and making ready to send the friends of the patient a little money to insure a decent burial of the remains." No less intemperate and indecent is Wolff's<sup>3</sup> reference to the "episode of Darwinism" and his suggestion that our attitude toward Darwin should be "as if he had never existed."

<sup>1</sup> Driesch, H., *Biol Centralbl*, v 16, p 355. 1896.

<sup>2</sup> Dennert, E., "Vom Sterbelager des Darwinismus," p. 4, 1903.

<sup>3</sup> Wolff, G., "Beitrage zur Kritik der Darwin'schen Lehre," p. 54, 1898.

Alvar Ellegård

THE DARWINIAN  
THEORY AND THE  
ARGUMENT FROM  
DESIGN

*Lychnos* (1956):173-192.

1956

Now the theory of Natural Selection was the only feature that distinguished Darwin from the earlier evolutionists, of whom Lamarck may be considered as the chief spokesman. We therefore have the paradoxical situation that ten years after Darwin had published, almost everybody who was at all in a position to judge had been converted to Evolution, not in Darwin's form, but in the version which the same people, a few years earlier, had declared wholly untenable and unscientific. The Natural Selection theory clearly met with incomparably stronger resistance than the Evolution theory as such. This circumstance in itself would justify the assertion that Natural Selection touched the ideology of the age at a more vital point than did the Evolution theory pure and simple.

The evidence leaves no doubt as to what the point was. The theory of Natural Selection was seen to cut away the ground from under the Design argument. . . . It was difficult to regard as simple, lucid, and beautiful a process which gave rise to a thou-

*Samuel Wilberforce*

1805-1873

IS MR. DARWIN  
A CHRISTIAN?

Review of the *Origin of Species*  
(Published anonymously)

*Quarterly Review*, 108 (July  
1860):225-264

1860

Mr. Darwin writes as a Christian, and we doubt not that he is one. We do not for a moment believe him to be one of those who retain in some corner of their hearts a secret unbelief which they dare not vent; and we therefore pray him to consider well the grounds on which we brand his speculation with the charge of such a tendency. First, then, he not obscurely declares that he applies his scheme of the action of the principle of natural selection to MAN himself, as well as to the animals around him. Now, we must say at once, and openly, that such a notion is absolutely incompatible not only with single expressions in the word of God on that subject of natural science with which it is not immediately concerned, but, which in our judgment is of far more importance, with the whole representation of that moral and spiritual condition of man which is its proper subject-matter. Man's derived supremacy over the earth; man's power of articulate speech; man's gift of reason; man's free-will and responsibil-

ity; man's fall and man's redemption; the incarnation of the Eternal Son; the indwelling of the Eternal Spirit,—all are equally and utterly irreconcilable with the degrading notion of the brute origin of him who was created in the image of God, and redeemed by the Eternal Son assuming to himself his nature. Equally inconsistent, too, not with any passing expressions, but with the whole scheme of God's dealing with man as recorded in His word, is Mr. Darwin's daring notion of man's further development into some unknown extent of powers, and shape, and size through natural selection acting through that long vista of ages which he casts mistily over the earth upon the most favoured individuals of his species. We care not in these pages to push the argument further. We have done enough for our purpose in thus succinctly intimating its course.

Every history of Darwinism delightedly recounts the famous Huxley-Wilberforce debate, the principal historical source being the *Life and Letters of T. H. Huxley*. In 1953, almost a century after the event, a new document was uncovered. It was published in a paper by D. J. Foskett, "Wilberforce and Huxley on Evolution," reproduced here in its entirety. (G. H.)

*Thomas Henry Huxley*

1825-1895

THE HUXLEY-  
WILBERFORCE DEBA

*Nature*, 172(1953):920

1860

## 63

Every history of Darwinism delightedly recounts the famous Huxley-Wilberforce debate, the principal historical source being the *Life and Letters of T. H. Huxley*. In 1953, almost a century after the event, a new document was uncovered. It was published in a paper by D. J. Foskett, "Wilberforce and Huxley on Evolution," reproduced here in its entirety. (G. H.)

*Thomas Henry Huxley*

1825-1895

THE HUXLEY-  
WILBERFORCE DEBATE

*Nature*, 172(1953):920

1860

It was a famous moment in the history of science when, during the discussion of Darwin's theory of evolution at the British Association meeting at Oxford in 1860, Bishop Wilberforce turned to T. H. Huxley and asked him whether he claimed descent from an ape on his father's or his mother's side.

The actual words of Huxley's reply are not known; in the excitement, members of the audience noted different points, and two or three versions appear in the biographies and histories. The main source of our information, his son Leonard Huxley, wrote "most unluckily, no contemporary account of his own exists of the encounter."<sup>1</sup>

<sup>1</sup> Huxley, Leonard, "The Life and Letters of T. H. Huxley," I, 259 (Macmillan, 1903).

## 63

Every history of Darwinism delightedly recounts the famous Huxley-Wilberforce debate, the principal historical source being the *Life and Letters of T. H. Huxley*. In 1953, almost a century after the event, a new document was uncovered. It was published in a paper by D. J. Foskett, "Wilberforce and Huxley on Evolution," reproduced here in its entirety. (G. H.)

*Thomas Henry Huxley*

1825-1895

THE HUXLEY-  
WILBERFORCE DEBATE

*Nature*, 172(1953):920

1860

It was a famous moment in the history of science when, during the discussion of Darwin's theory of evolution at the British Association meeting at Oxford in 1860, Bishop Wilberforce turned to T. H. Huxley and asked him whether he claimed descent from an ape on his father's or his mother's side.

The actual words of Huxley's reply are not known; in the excitement, members of the audience noted different points, and two or three versions appear in the biographies and histories. The main source of our information, his son Leonard Huxley, wrote "most unluckily, no contemporary account of his own exists of the encounter."<sup>1</sup>

<sup>1</sup> Huxley, Leonard, "The Life and Letters of T. H. Huxley," I, 259 (Macmillan, 1903).

# 64

*Louis Agassiz*

1807-1873

DO SPECIES EXIST?

Review of the *Origin of Species*

*American Journal of Science*, July,  
1860: p. 143

1860

It seems to me that there is much confusion of ideas in the general statement of the variability of species so often repeated lately. If species do not exist at all, as the supporters of the transmutation theory maintain, how can they vary? And if individuals alone exist, how can the differences which may be observed among them prove the variability of species?

# 65

The following passage is taken from *More Letters of Charles Darwin* (vol. I, p. 225), edited by F. Darwin and A. C. Seward. (G. H.)

*Charles Kingsley*

1819-1875

AN ALTERNATIVE TO PALEY

1862

Kingsley's letter to Huxley, dated Dec. 20th, 1862, contains a story or parable of a heathen Khan in Tartary who was visited by a pair of proselytising Moollahs. The first Moollah said: "Oh! Khan, worship my God. He is so wise that he made all things." But Moollah No. 2 won the day by pointing out that his God is "so wise that he makes all things make themselves."

# 66

*Charles Darwin*

1809-1882

REPUDIATION OF  
LAMARCK

Letter to Charles Lyell, 12 March  
1863

From *Life and Letters*

1863

Lastly, you refer repeatedly to my view as a modification of Lamarck's doctrine of development and progression. If this is your deliberate opinion there is nothing to be said, but it does not seem so to me. Plato, Buffon, my grandfather before Lamarck, and others, propounded the *obvious* views that if species were not created separately they must have descended from other species, and I can see nothing else in common between the 'Origin' and Lamarck. I believe this way of putting the case is very injurious to its acceptance, as it implies necessary progression, and closely connects Wallace's and my views with what I consider, after two deliberate readings, as a wretched book, and one from which (I well remember my surprise) I gained nothing.

# 67

*Benjamin Disraeli*

1804-1881

APE OR ANGEL?

From a speech at Oxford

1864

What is the question now placed before society with a glib assurance the most astounding? The question is this—Is man an ape or an angel? My Lord, I am on the side of the angels.

# 68

*Charles Darwin*

1809-1882

ON THE IMPORTANCE  
OF WORDS

Letter to Alfred Russel Wallace,  
5 July 1866

From *Life and Letters*

1866

My Dear Wallace,—I have been much interested by your letter, which is as clear as daylight. I fully agree with all that you say

69

*Athenaeum*

DARWIN REFUTED

Review of a Work on Evolution  
*Athenaeum*, 2102 (8 February  
1867) 217

1867

In the theory with which we have to deal, Absolute Ignorance is the artificer, so that we may enunciate as the fundamental principle of the whole system, that, IN ORDER TO MAKE A PERFECT AND BEAUTIFUL MACHINE, IT IS NOT REQUISITE TO KNOW HOW TO MAKE IT. This proposition will be found, on careful examination, to express, in a condensed form, the essential purport of the Theory, and to express in a few words all Mr. Darwin's meaning, who, by a strange inversion of reasoning, seems to think Absolute Ignorance fully qualified to take the place of Absolute Wisdom in all the achievements of creative skill.

## 70

*Matthew Arnold*

1822-1888

DOVER BEACH

1867

The sea is calm to-night.  
 The tide is full, the moon lies fair  
 Upon the straits;—on the French coast the light  
 Gleams and is gone; the cliffs of England stand  
 Glimmering and vast, out in the tranquil bay.

Come to the window, sweet is the night-air!  
 Only, from the long line of spray  
 Where the sea meets the moon-blanch'd land,  
 Listen! you hear the grating roar  
 Of pebbles which the waves draw back, and fling.  
 At their return, up the high strand,  
 Begin, and cease, and then again begin,  
 With tremulous cadence slow, and bring  
 The eternal note of sadness in.

Sophocles long ago  
 Heard it on the Ægean, and it brought  
 Into his mind the turbid ebb and flow,  
 Of human misery; we  
 Find also in the sound a thought,  
 Hearing it by this distant northern sea.

### The Sea of Faith

Was once, too, at the full, and round earth's shore  
Lay like the folds of a bright girdle furl'd.  
But now I only hear  
Its melancholy, long, withdrawing roar,  
Retreating, to the breath  
Of the night-wind, down the vast edges drear  
And naked shingles of the world.

Ah, love, let us be true  
To one another! for the world, which seems  
To lie before us like a land of dreams,  
So various, so beautiful, so new,  
Hath really neither joy, nor love, nor light,  
Nor certitude, nor peace, nor help for pain;  
And we are here as on a darkling plain  
Swept with confused alarms of struggle and flight,  
Where ignorant armies clash by night.

## 70

*Matthew Arnold* | DOVER BEACH

1822-1888

1867

The sea is calm to-night.  
 The tide is full, the moon lies fair  
 Upon the straits;—on the French coast the light  
 Gleams and is gone; the cliffs of England stand  
 Glimmering and vast, out in the tranquil bay.

Come to the window, sweet is the night-air!  
 Only, from the long line of spray  
 Where the sea meets the moon-blanch'd land,  
 Listen! you hear the grating roar  
 Of pebbles which the waves draw back, and fling  
 At their return, up the high strand,  
 Begin, and cease, and then again begin,  
 With tremulous cadence slow, and bring  
 The eternal note of sadness in.

Sophocles long ago  
 Heard it on the *Ægean*, and it brought  
 Into his mind the turbid ebb and flow,  
 Of human misery; we  
 Find also in the sound a thought,  
 Hearing it by this distant northern sea.

The Sea of Faith

Was once, too, at the full, and round earth's shore  
Lay like the folds of a bright girdle furl'd.  
But now I only hear  
Its melancholy, long, withdrawing roar,  
Retreating, to the breath  
Of the night-wind, down the vast edges drear  
And naked shingles of the world.

Ah, love, let us be true  
To one another! for the world, which seems  
To lie before us like a land of dreams,  
So various, so beautiful, so new,  
Hath really neither joy, nor love, nor light,  
Nor certitude, nor peace, nor help for pain,  
And we are here as on a darkling plain  
Swept with confused alarms of struggle and flight,  
Where ignorant armies clash by night.

The following letter to Galton's cousin, Charles Darwin, is taken from C. P. Blacker, *Eugenics: Galton and After*, 1952, p. 83. (G. H.)

*Francis Galton*  
1822-1911

LIBERATION FROM  
PALEY

My Dear Darwin,

It would be idle to speak of the delight your letter has given me, for there is no one in the world whose approbation in these matters can have the same weight as yours. Neither is there any one whose approbation I prize more highly, on purely personal grounds, because I always think of you in the same way as converts from barbarism think of the teacher who first relieved them from the intolerable burden of superstition. I used to be wretched under the weight of the old-fashioned arguments from design, of which I felt, though I was unable to prove to myself, the worthlessness. Consequently, the appearance of your *Origin of Species* formed a real crisis in my life; your book drove away the constraint of my old superstition as if it had been a nightmare and was the first to give me freedom of thought.

All are but parts of one stupendous whole,  
Whose body Nature is, and God the soul;

that there are laws, albeit almost unknown to us—not laws merely of external circumstance, but laws of internal growth and structure—which actively modify each individual organism, not only for its own advantage in the struggle for life, but for the higher end of subordinating every individual existence to the good of the whole.

# 73

In his biographical notes, Ernest Chester Thomas, the translator of the following work, has this to report of the German philosopher and historian, F. A. Lange: "His heart beat for the lot of the masses, and he felt that the question of labour would be the great problem of the coming time, as it was the question that decided the fall of the ancient world. The core of this problem he believed to be 'the struggle against the struggle for existence,' which is identified with man's spiritual destiny." (G. H.)

*Frederick Albert Lange*

1828-1875

THE HISTORY OF  
MATERIALISM

*New York: Harcourt Brace. Third  
ed. (First ed., 1866)*

1877

All teleology has its root in the view that the builder of the universe acts in such a way that man must, on the analogy of human reason, call his action purposeful. . . . It can now, however, be no longer doubted that nature proceeds in a way which has no

75

*G. F. Gause*

1910-

THE STRUGGLE FOR  
EXISTENCE

*Baltimore: Williams & Wilkins*

1934

We have seen natural selection laid on its *Sterbebett*, and subsequently revived again in the most recent times to a remarkable degree of vigor. There can be no doubt that the old idea has great survival value.

sand times more waste products than finished articles. This feeling was expressed in a review in the [London] *Times* [31 January 1867, p. 5] of an anti-Darwinian treatise: "Natural selection . . . is adaptation by chance, and therefore not, by design. . . . It is . . . a theory of waste . . . and in that it does violence to nature, of which economy is a fundamental law. . . ."

Darwin himself had, however, reckoned with the painful readjustment that his theory would necessitate, and he diligently sought to soften the shock. By so doing he certainly succeeded in gaining a more sympathetic hearing. . . . At the same time, by his concessions to the religious feelings of the public Darwin indubitably made it more difficult for his readers to understand his theory. The way the Natural Selection theory was misrepresented in the press was, as Darwin often complains in his correspondence, simply amazing. It is obvious that the critics did not wish to understand, and to some extent Darwin himself encouraged their wishful thinking. . . .

At the present day there is hardly any doubt that the basic process underlying variation is a random one. But it has taken a long time to establish this experimentally, and it is interesting to observe that each time some experiment has appeared to contradict this assumption, it has been seized upon and advertized by metaphysically minded biologists and laymen as an indication of predetermined evolution. It is significant that among novelists and poets—in fact, among non-scientists generally—it is this kind of evolutionism that has always been predominant.

77

*Morse Peckham*

DARWINISM AND  
DARWINISTICISM

*Victorian Studies*, 3:19-40

1959

Evolution may be considered as a fairly straightforward metaphysical theory with a long history which was not so much confirmed by the theory of natural selection as embarrassed by it. The difference between the two is indicated by the fact that Darwin himself did not use the word until the fifth edition of the *Origin* (1869), and then he appears to have used it with some hesitation, almost as if he did not quite know what he was talking about.